

**REMARKS**

The Examiner is thanked for the due consideration given the application. This amendment is being filed concurrent with a Request for Continued Examination.

Claims 1-7 and 10-18 are pending in the application. Claim 17 has been withdrawn from consideration. By this amendment claim 9 is canceled and its subject matter has been generally incorporated into claim 1 except for the noble metals of rhenium, osmium, iridium, palladium and gold. Claim 10 has been amended to remove recitations of rhenium, osmium, iridium, palladium and gold. Claim 11 has been amended to not recite gold. The instant claims thus do not recite noble metals.

No new matter is believed to be added to the application by this amendment.

**Rejection Over HIRATA et al.**

Claims 1-7, 9-16 and 18 have been rejected under 35 USC §103(a) as being unpatentable over HIRATA et al. (USP 6,106,589). This rejection is respectfully traversed.

The present invention pertains to a method allowing the removal of metals in ionic form in solution in water or aqueous effluents in which a metal completely or partially coated with hydrogen is utilized. This method aims at the elimination of these metal ions in the aqueous

effluents from industry and for the treatment of water for human consumption.

Instant claim 1 of the present invention now sets forth a process for removing metal ions that are not noble metal ions.

In contrast, HIRATA et al. teaches that the solution **must** contain noble metal ions. HIRATA et al. thus teach away from the present invention.

The Official Action asserts that HIRATA et al. disclose a method for reducing the content of contaminating metals in ionic form present in aqueous effluents, the method including the steps of providing an aqueous effluent including at least a metal in ionic form, placing the aqueous effluent in contact with at least a metal that is "obviously" completely or partially coated with hydrogen before and during the placing in contact with the metal ions; and recovering the aqueous effluent.

However, a detailed review of the disclosure of HIRATA et al. will review fundamental differences between this reference and the present invention.

Column 1, third paragraph of HIRATA et al. explains the following:

*As a method for selectively and efficiently recover metal ions, particularly noble metal*

ions, in an aqueous solution, a method has been proposed in which a supported product having a redox reaction reagent represented by a compound having a hydroquinone structure such as an anthrahydroquinone compound, adsorbed and fixed on a porous carrier (this supported product will hereinafter be referred to simply as a metal ion-treating agent) is packed in e.g. a column, and an aqueous solution containing noble metal ions such as gold ions (inclusive of complex ions) is passed therethrough for treatment, so that the noble metal ions are reduced and captured as zerovalent metal on said metal ion-treating agent (U.S. Pat. No. 5,474,593).

This method corresponds to the treatment of an aqueous solution comprising palladium or gold ions with anthrahydroquinone supported on a porous carrier. This specific solid (anthrahydroquinone supported on a porous carrier) is designated under the expression "metal ion treating agent."

The mechanism implemented in this process can be schematically presented as a two process steps as follows:

- a) the anthrahydroquinone reduces metallic ions present in the solution into a zero-valent metal, then
- b) the anthrahydroquinone enables the formation of a hydrogen coating on the surface of the zero-valent

metal formed, thus allowing the reduction of the other metallic ions and its deposition on the surface of the zero-valent metal previously formed in step a). As a consequence the deposited zero-valent metal grows.

Such a mechanism is possible only if the metal ion formed by the reduction of the anthrahydroquinone can adsorb a hydrogen layer. Only noble metals have the property to adsorb a hydrogen layer. Indeed, in the process of the invention, when non noble metal is chemisorbed on the metal  $M_h$  its potential becomes higher than that of hydrogen making the absorption of hydrogen impossible. Thus the process of the prior art can only be carried out to eliminate noble metallic ions from an aqueous solution.

HIRATA et al. indicates that this process has a serious disadvantage since the recovery rate of noble metal tends to be low (end of 4<sup>th</sup> paragraph of column 1).

HIRATA et al. at the 5<sup>th</sup> paragraph of column 1 then emphasizes that he discovered a similar method which improves the recovery rate of noble metal.

*To accomplish the object, the present inventors have conducted an extensive research for a method whereby the reduction reaction of noble metal complex ions will smoothly proceed on the metal ion-treating agent and as a result, have reached a concept that transfer of electrons on the metal*

*ion-treating agent is hindered by some factors, whereby the reduction rate of the noble metal complex ions tends to be low. Accordingly, they have studied a method for improving the reduction rate, and as a result have reached an idea that the transfer rate of electrons can be improved by having a metal preliminarily supported on the metal ion-treating agent. Accordingly, an aqueous solution containing . . .*

The method of HIRATA et al. entails using a modified metal ion treating agent. This modified metal ion treating agent is the metal ion treating agent of the conventional art (anthraquinone on a porous carrier) onto which a metal is deposited. As explained by HIRATA et al. the metal supported in the treating agent is a catalyst which enables and improves the transfer of hydrogen from the anthraquinone. The mechanism is still the same as the mechanism described above in the conventional art, that is the mechanism of metal growth is due to the capacity of the metal to adsorb hydrogen which enables the deposition of additional metallic ions. HIRATA et al. only add the metal to catalyze the reaction.

At column 6, lines 22-26 HIRATA et al. states: "it is considered that when the noble metal complex ions are in contact with the treating agent, the complex ions

are reduced by the anthraquinone compound by means of the metal supported on the treating agent, whereby the noble metal will be laminated and will grow . . ."

HIRATA et al. insists on the fact that the "aqueous solution to be treated may be any solution **so long as it is an aqueous solution containing gold cyano complex ions or palladium complex ions.**" Column 2, lines 14-17.

Thus HIRATA et al. insists on the fact that his process could work only if the metallic ions to be treated are noble metal ions (gold and palladium), which is consistent with the fact that the mechanism could work only if the metallic ions are noble metallic ions.

In comparison, the present invention does not pertain to noble metal ions (as is set forth in the instant claims). HIRATA et al. accordingly teaches away from the present invention.

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

Also, one of skill in the art would not try to carry out the process of HIRATA et al. for the elimination of non noble metallic ions (as in amended claim 1), since

non noble metallic ions do not have the property to adsorb hydrogen, which is the essential mechanism of the HIRATA et al. process to eliminate metallic ions.

Thus the process of present claim 1 and its dependant claims are non obvious over HIRATA et al.

Therefore, the understanding of HIRATA et al. by the inventors is that HIRATA et al. teach a process that seems to be quite efficient with noble metals because once a first layer of noble metal is deposited, the mechanism may be pursued as long as noble metal ions and reducing agent are present: the deposited noble metals "grow".

On the contrary, in the present invention, the metals to be eliminated do not react in the same way and only a single layer of deposited metal can be obtained.

Additional distinctions of the present invention over HIRATA et al. are of record in the application which, for brevity, are not repeated here.

One of ordinary skill and creativity would thus not produce a claimed embodiment of the present invention from a knowledge of HIRATA et al., and a *prima facie* case of unpatentability has thus not been made.

This rejection is believed to be overcome, and withdrawal thereof is respectfully requested.

**Conclusion**

It is believed that the rejection has been overcome, obviated or rendered moot, and no issues remain. The Examiner is accordingly respectfully requested to place the application in condition for allowance and to issue a Notice of Allowability.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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